International Journal of Infectious Diseases 24 (2014) 40–42

Contents lists available at ScienceDirect

International Journal of Infectious Diseases

journal homepage: www.elsevier.com/locate/ijid

Short Communication

Comparison of the characteristics of elderly influenza patients in two consecutive seasons

Shui Shan Lee [a,*], Kin Wang To [b], Ngai Sze Wong [a], Kin Wing Choi [c], Krystal C.K. Lee [a]

[a] Stanley Ho Centre for Emerging Infectious Diseases, The Chinese University of Hong Kong, Hong Kong, China
[b] Department of Medicine and Therapeutics, The Chinese University of Hong Kong, Hong Kong, China
[c] Department of Medicine, Alice Ho Miu Ling Nethersole Hospital, Hong Kong, China

ARTICLE INFO

Article history:
Received 13 February 2014
Received in revised form 25 February 2014
Accepted 17 March 2014

Corresponding Editor: Eskild Petersen, Aarhus, Denmark

Keywords:
Seasonal influenza
Elderly
Household structure
Social space

SUMMARY

The seasonality of influenza infections can be affected by virus subtypes, climate, and social networking in populations. While these factors are well known, their relative influences in specific age groups have not been fully investigated. During 2010–2011, patients aged 65 years and above with influenza virus infections were recruited from a regional hospital in Hong Kong. They were either residents of homes for the elderly ($n = 60$) or living with their family ($n = 75$). Two seasons were distinguished, the summer season of 2010 dominated by H3N2 and the winter season of 2011 dominated by H1N1. The patients' clinical presentations and patterns of inter-personal connectivity were assessed. Overall, more elderly people living with their family were diagnosed with H1N1 compared to those in the homes for the elderly, and the former had visited a more diverse range of places 1 week prior to diagnosis. A higher proportion of patients living with family presented with lower respiratory tract symptoms, but these patients were less likely to have pre-existing chronic diseases. The results suggest that elderly patients infected during an influenza season could vary by virus subtype, which in turn is dependent on exposure locations and the pattern of social connectivity.

1. Introduction

Influenza seasonality is influenced by factors ranging from virus subtypes, demographics, and climate to inter-personal connectivity patterns. During the pandemic of influenza A (H1N1)pdm09 (hereafter referred to as H1N1), children were preferentially infected,[1] while elderly people were relatively spared due to partial immunity.[2] For H3N2, however, the influence of age on transmissibility is not obvious.[1,2] Transmission studies have led to similar conclusions on the age-dependency of the household secondary attack proportion for H1N1 and H3N2.[3,4] In any case, the overall influenza-associated hospital admission rate for elderly people has never been low.[5]

In this study, we set out to investigate the clinical, social, and demographic characteristics of elderly patients in the course of two influenza seasons in subtropical Hong Kong.

2. Methods

An observational study was piloted to enrol, over a 1-year period, all in-patients aged over 64 years diagnosed with a respiratory virus infection at the Alice Ho Miu Ling Nethersole Hospital, a regional hospital for Tai Po District (148 km^2) in Hong Kong, China. A diagnosis was made if a patient tested positive for a respiratory virus by nasopharyngeal aspirate (NPA) test. All were residents of the same district, who were either living in homes for the elderly or with their family. Approval of the Joint Chinese University of Hong Kong-New Territories East Cluster Clinical Research Ethics Committee was obtained. We categorized patients by influenza subtype and plotted the epidemic curve to define seasons and inter-seasonal periods.

* Corresponding author. Tel.: +1 852 2252 8881; fax: +1 852 2635 4977.
E-mail address: sslee@cuhk.edu.hk (S.S. Lee).

http://dx.doi.org/10.1016/j.ijid.2014.03.1384

Data collection was done by interviews supplemented with chart reviews, to record demographic, clinical, and outcome characteristics of the patients enrolled. In addition, the patient's social space was recorded, which was defined as the setting or location where the respondent had interacted personally with other people for at least 1 h in the 1-week period before symptom detection.

The statistical analysis was performed using IBM SPSS Statistics for Windows, version 21.0 (IBM Corp., Armonk, NY, USA). The odds ratio (OR) was used to analyse factors associated with the influenza seasons and dwelling status of the elderly patients.

3. Results

Between April 2010 and March 2011, 2739 patients underwent NPA screening on admission. Among these, 188 were positive for a respiratory virus infection. From the epidemic curve, two influenza seasons and three inter-seasonal periods could be delineated (**Supplementary Material**, Figure S1): influenza season 1 (summer 2010) dominated by H3N2 and season 2 (winter 2011) dominated by H1N1. A total of 135 elderly patients were enrolled; 75 were from homes for the elderly and 60 were living with family. Three-quarters were hospitalized during an influenza season, half of whom were diagnosed in season 1. Only 32% had received the seasonal influenza vaccine and 17% had been immunized against H1N1 before the epidemics.

Table 1 compares the characteristics of residents of homes for the elderly and those living with family. The proportion of elderly patients living with family in season 1 was lower than elderly home residents (OR 0.43, $p = 0.02$), whereas this was the reverse in season 2 (OR 3.59, $p = 0.01$). The proportion with the H1N1 subtype was higher in patients living with family (OR 4.44, $p = 0.01$), while there was no significant difference for H3N2. Clinically, patients living with family were more likely to have presented with lower respiratory tract symptoms like dyspnoea (OR 3.06, $p = 0.004$) and a systemic upset (headache and dizziness, OR 6.64, $p = 0.01$), and to have been treated with antibiotics (OR 11, $p < 0.001$), but had a lower likelihood of pre-existing respiratory diseases (OR 0.21, $p < 0.001$), compared to residents of homes for the elderly.

Overall, the three most popular social spaces visited 1 week before influenza diagnosis were shopping arcade/market, restaurant, and urban park (Table 2). More patients in season 2 (winter) had visited restaurants (OR 16.7, $p < 0.001$) than those in season 1 (summer). The proportion of patients not having visited any social space in season 1 was significantly lower in patients living with family (OR 0.1, $p = 0.01$).

4. Discussion

During the two influenza seasons in 2010/2011, a varied pattern of clinical and demographic characteristics of elderly patients in Hong Kong could be delineated. Their dwelling status and variation of patterns of social networking appeared to be important distinguishing factors.[6–8] Even though the transmissibility of H1N1 and H3N2 has been reported to be the same,[3] elderly patients diagnosed with H1N1 in either season were more likely to

Table 1
Comparison of characteristics of elderly patients aged >64 years living in a home for the elderly ($n = 75$) versus those living with family ($n = 60$)

	Elderly home ($n = 75$)		Family ($n = 60$)				
	Count	%	Count	%	OR	95% CI	*p*-Value
Time of diagnosis							
Influenza season	57/75	76.0%	45/60	75.0%	-	-	-
Season 1 (summer 2010)	49/75	65.3%	27/60	45.0%	0.43	0.22–0.87	0.02[a]
Season 2 (winter 2011)	8/75	10.7%	18/60	30.0%	3.59	1.43–8.99	0.01[a]
Influenza inter-seasonal period	18/75	24.0%	15/60	25.0%	-	-	-
Inter-seasonal period 1	0/75	0.0%	3/60	5.0%	-	-	-
Inter-seasonal period 2	2/75	2.7%	4/60	6.7%	2.60	0.46–14.75	0.28
Inter-seasonal period 3	16/75	21.3%	8/60	13.3%	0.57	0.23–1.43	0.23
Influenza virus subtype for respective season							
H3N2	37/75	49.3%	26/60	43.3%	0.79	0.40–1.55	0.49
H1N1	4/75	5.3%	12/60	20.0%	4.44	1.35–14.58	0.01[a]
Other	34/75	45.3%	22/60	36.7%	0.70	0.35–1.40	0.31
Socio-demographics							
Male gender	30/75	40.0%	32/60	53.3%	1.71	0.86–3.40	0.12
Work/study	0/16	0.0%	2/48	4.2%	-	-	-
Ever smoked	10/17	58.8%	28/48	58.3%	0.98	0.32–3.01	0.97
Clinical characteristics							
Presentation							
Cough	57/75	76.0%	50/60	83.3%	1.58	0.67–3.74	0.30
Upper respiratory tract symptoms[b]	33/75	44.0%	27/60	45.0%	1.04	0.53–2.06	0.91
Lower respiratory tract symptoms[c]	15/75	20.0%	26/60	43.3%	3.06	1.43–6.55	0.004[a]
Systemic upset[d]	66/75	88.0%	52/60	86.7%	0.89	0.32–2.46	0.82
Pre-existing chronic disease							
No chronic illnesses	14/75	18.7%	8/60	13.3%	0.67	0.26–1.72	0.41
Vascular diseases	49/75	65.3%	47/60	78.3%	1.92	0.88–4.17	0.10
Respiratory diseases	53/75	70.7%	20/60	33.3%	0.21	0.10–0.43	<0.001[a]
Treatment received							
Tamiflu	47/75	62.7%	46/60	76.7%	1.96	0.92–4.18	0.08
Antibiotics	15/75	20.0%	44/60	73.3%	11.00	4.92–24.60	<0.001[a]
Steroid	31/75	41.3%	17/60	28.3%	0.56	0.27–1.16	0.12
Vaccination							
Seasonal influenza	5/14	35.7%	14/46	30.4%	0.79	0.22–2.78	0.71
H1N1	2/13	15.4%	8/46	17.4%	1.16	0.21–6.27	0.87
Contact with influenza patient	1/6	16.7%	10/36	27.8%	1.92	0.20–18.57	0.57

[a] *p*-Value <0.05.
[b] 'Upper respiratory tract symptoms' refers to runny nose/sore throat.
[c] 'Lower respiratory tract symptoms' refers to dyspnoea.
[d] 'Systemic upset' refers to any fever and/or headache and dizziness.

Table 2
Comparison of social space between season 1 and season 2, and between patients living in a home for the elderly and with family in each season

	Season 1 (n = 32)[a]				Season 2 (n = 17)[a]				Season 1 vs. 2
	Elderly home (n = 9), %	Family (n = 23), %	OR (95% CI)	Total, %	Elderly home (n = 2), %	Family (n = 15), %	OR (95% CI)	Total, %	OR (95% CI)
Social space listed in questionnaire[b]									
Church	0	0	-	0	0	7	-	6	-
Karaoke	0	0	-	0	0	0	-	0	-
Elderly centre	0	4	-	3	0	13	-	12	4.1 (0.3–49.3)
Restaurant	11	26	2.8 (0.3–27.5)	22	100	80	-	82	16.7 (3.7–74.9)[c]
Computer games centre	0	0	-	0	0	0	-	0	-
Public library	0	0	-	0	0	0	-	0	-
Shopping arcade/market	11	44	6.2 (0.7–57.6)	34	50	40	0.7 (0.04–12.8)	41	1.3 (0.4–4.5)
Unsheltered market	0	17	-	13	0	7	-	6	0.4 (0.05–4.3)[c]
Gym or fitness centres	0	13	-	9	100	100	-	0	-
Beauty salon	0	4	-	3	100	100	-	0	-
Urban park	0	30	-	22	0	27	-	24	1.1 (0.3–4.5)
Country park	0	0	-	0	0	0	-	0	-
Not visited the listed social spaces in the previous 1 week	78	22	0.1 (0.01–0.6)[c]	38	0	7	-	6	0.1 (0.01–0.9)[c]

[a] All patients with social space data in the season were included irrespective of the respiratory virus infection diagnosed.
[b] Social space was defined as the setting or location where a respondent had interacted personally with other people for at least 1 h in the 1-week period immediately before diagnosis of the current episode of influenza infection.
[c] p-Value <0.05.

be living with family. The spectrum of social spaces of patients in the season dominated by H1N1 was broader than that of the H3N2 season.

We acknowledge that our methodological approaches carry limitations, including recall bias and failure to collect comprehensive information on social space from all recruited elderly patients. We caution against the extrapolation of results to the community in general. We are also aware that people having visited a specific social space might not have met one another in person. A similar profile of social spaces can, however, be treated as a surrogate for specific social networking patterns for individuals in the same neighbourhood. Using the network-based approach, we have demonstrated that elderly patients living with family were more susceptible to H1N1 than those living in homes for the elderly, under the influence of a more diverse social space and possible contact with different age groups.

Acknowledgements

The authors thank all of the staff of Alice Ho Miu Ling Nethersole Hospital for facilitating the study, Miss Elsie Chu for administering the questionnaire survey, and all patients enrolled for supporting the study. Miss Mandy Li is thanked for her assistance in data entry and management.

Ethical approval: The approval of the Joint Chinese University of Hong Kong-New Territories East Cluster Clinical Research Ethics Committee was obtained.

Funding: This study was funded by the Research Fund for the Control of Infectious Diseases, Food and Health Bureau, Hong Kong Special Administrative Region Government (CU-09-04-01). The funding agency was not involved at any stage in the design of the study, its interpretation, or the writing of the manuscript.

Conflict of interest: The authors declare no conflicts of interest with respect to the authorship and/or publication of this article.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.ijid.2014.03.1384.

References

1. Lunelli A, Rizzo C, Puzelli S, Bella A, Montomoli E, Rota MC, et al. Understanding the dynamics of seasonal influenza in Italy: incidence, transmissibility and population susceptibility in a 9-year period. *Influenza Other Respir Viruses* 2013;**7**:286–95.
2. Xu R, Ekiert DC, Krause JC, Hai R, Crowe Jr JE, Wilson IA. Structural basis of preexisting immunity to the 2009 H1N1 pandemic influenza virus. *Science* 2010;**328**:357–60.
3. Klick B, Nishiura H, Ng S, Fang VJ, Leung GM, Peiris JS, et al. Transmissibility of seasonal and pandemic influenza in a cohort of households in Hong Kong in 2009. *Epidemiology* 2011;**22**:793–6.
4. Savage R, Whelan M, Johnson I, Rea E, LaFreniere M, Rosella LC, et al. Assessing secondary attack rates among household contacts at the beginning of the influenza A (H1N1) pandemic in Ontario, Canada, April–June 2009: a prospective, observational study. *BMC Public Health* 2011;**11**:234.
5. Centre for Health Protection, Department of Health, Government of the Hong Kong Special Administrative Region. Centre for Health Protection—Flu express. Centre for Health Protection, 2013; Available at: http://www.chp.gov.hk/en/guideline1_year/29/134/441/304.html (accessed October 30, 2013).
6. Apolloni A, Poletto C, Colizza V. Age-specific contacts and travel patterns in the spatial spread of 2009 H1N1 influenza pandemic. *BMC Infect Dis* 2013;**13**:176.
7. Potter GE, Handcock MS, Longini Jr IM, Halloran ME. Estimating within-school contact networks to understand influenza transmission. *Ann Appl Stat* 2012;**6**:1–26.
8. Balcan D, Colizza V, Gonçalves B, Hu H, Ramasco JJ, Vespignani A. Multiscale mobility networks and the spatial spreading of infectious diseases. *Proc Natl Acad Sci U S A* 2009;**106**:21484–9.